Summer School "Basic Aerosol Science“ – Programm

Monday, 10 July 2017 – Saturday, 15 July 2017

Fakultät für Physik
Lise-Meitner-Hörsaal & Christian-Doppler-Hörsaal
Strudlhofgasse 4, 1090 Wien

SUNDAY, 9 July 2017

18:00	**Optional: City walking tour** **Meeting point:** Strudlhofgasse 4 (in front of the main entrance of the physics building)

MONDAY, 10 July 2017 - BASICS **(Room: Christian-Doppler-Hörsaal, 3rd floor)**

07:30-08:30	**Registration & coffee**
08:30-09:00	**Welcome, presentation of participants, opening (Prof. Dr. Weinzierl)**
09:00-10:30	**Aerosol mechanics (Dr. Wonaschütz)**: shape of aerosol particles, equivalent diameters, Kndusen number, Stokes' law, slip correction, stopping distance, settling velocity, diffusion, coagulation, Maxwell-Boltzmann distribution of molecular velocities, Fick's diffusion laws, Brownian motion, diffusion coefficient
10:30-11:00	**Coffee break**
11:00-12:30	**Aerosol optics (Prof. Dr. Horvath)**: interaction of light with particles: scattering, absorption, extinction, Mie theory, phase function, mixed particles
12:30-14:00	**Lunch break**
14:00-15:30	**Particle statistics (Prof. Dr. Salma)**: particle number, surface and mass size distributions, lognormal distribution function, modes of size distributions, important size intervals, average diameters, moments of size distributions, inversion problem, applications
15:30-16:00	**Coffee break**
16:00-17:30	**Nucleation and condensation - basics (Prof. Dr. Wagner)**: formation of aerosol particles, homomolecular homogeneous nucleation and heteromolecular homogeneous nucleation: models; heterogeneous nucleation: theory; nucleation theorem
19:00	**Heuriger**

TUESDAY, 11 July 2017 - BASICS **(Room: Lise-Meitner-Hörsaal, 1st floor)**

09:00-10:30 **Electrical properties of aerosols (Prof. Dr. Mäkelä)**: electrical mobility, charging mechanisms and charge limits, mobility distribution, Fuchs' charging theory

10:30-11:00 **Coffee break**

11:00-12:30 **Aerosol sampling and measurement (Prof. Dr. Salma)**: principles and major methods for off-line and on-line measurements, collection of samples: inlets, sampling devices, sampling artifacts and their correction; overview of major types of instruments

12:30-14:00 **Lunch break**

14:00-15:30 **Electrical aerosol measurement (Prof. Dr. Mäkelä)**: differential mobility spectrometer: measurement procedure, response with various sensors, data acquisition and data reduction, electrostatic emission characterization, dual differential mobility spectrometer, SMPS versus DMPS, measurements of transient aerosol conditions, examples for diesel particulate emission measurements

15:30-16:00 **Coffee break**

16:00-17:30 **Aerosol generation (Dr. Steiner)**: collison atomizer, electrospray, hot wire generator, spark generator, tube furnace, La Mer generator, fluidized bed generator, generation of calibration aerosols with a DMA

WEDNESDAY, 12 July 2017 – MEASUREMENT METHODS **(Room: Lise-Meitner-Hörsaal, 1st floor)**

09:00-10:30 **Optical particle measurements (Prof. Dr. Szymanski)**: single vs. multiple particle measurement, scattering and transmission measurements, single particle optical counters and spectrometers, multi-valued response, different designs of OPCs, accuracy, resolution and detection limits, coincidence errors, calibration

10:30-11:00 **Coffee break**

11:00-12:30 **Nucleation and condensation - measurements (Prof. Dr. Winkler)**: homogeneous and heterogeneous nucleation: experiments, condensation nuclei counters

12:30-14:00 **Lunch break**

14:00-15:30 **Inertial separation (Prof. Dr. Hitzenberger):** Stokes number, cyclone, impactor, flow through nozzle, efficiency curve of impacting jet, design criteria for impactors, virtual impactors, cyclone, aerodynamic particles sizer

15:30-16:00 **Coffee break**

16:00-17:30 **Diffusion and filtration (Prof. Dr. Hitzenberger)**: deposition by diffusion, deposition in ducts, diffusion batteries, diffusion denuders, filters: types of and artifacts, filtration theory, selection of filter media, EU PM standard, Sampling for analysis

THURSDAY, 13 July 2017 – ATMOSPHERIC AEROSOLS, MEASUREMENT METHODS (L-M-Hörsaal, 1st floor)

09:00-10:30 **Atmospheric aerosol (Prof. Dr. Weinzierl):** atmospheric aerosol system, size range, main constituents, sources and sinks of atmospheric particles, source strength, residence time, vertical distribution, deposition velocity, temporal trends, aircraft measurements

10:30-11:00 **Coffee break**

11:00-12:30 **Primary biological aerosol in the atmosphere (Prof. Dr. Jänicke):** observation of biological particles, model distributions, effects in the atmosphere (water uptake, freezing efficiency), measuring strategies, sources, examples for atmospheric data, open questions

12:30-14:00 **Lunch break**

14:00-15:30 **Aerosol remote sensing (Prof. Dr. Alados)**: remote sensing techniques and platforms, inverse problem, retrieval procedures, examples of columnar extinction measurements, LIDAR: backscattering, LIDAR equation, elastic and Raman technique, evaluation procedures, examples

15:30-16:00 **Coffee break**

16:00-17:30 **Modern spectroscopy as a tool for aerosol characterization (Prof. Dr. Niessner)**: modern spectroscopy as a tool for aerosol characterization, analytes of interest in modern aerosol science: nanostructured particles, bioaerosol, microencapsulated particles, chemical surface characterization: ESCA, laser – desorption mass spectrometry, Aerodyne aerosol mass spectrometer; bulk characterization: total reflection X-ray fluorescence, laser ablation mass spectrometry, FT-IR spectroscopy, Raman spectroscopy

FRIDAY, 14 July 2017 – AEROSOL CHEMISTRY, HEALTH ISSUES (Room: Lise-Meitner-Hörsaal, 1st floor)

09:00-10:30 **Aerosol chemistry (Prof. Dr. Kasper-Giebl)**: Chemistry basics, chemical composition (major and minor constituents, traces), composition and size, source identification, cloud processing, analytical methods (carbonaceous components TC/EC/OC/CC Sum parameters (HULIS), organic compounds, ionic compounds, main elements (mineral compounds))

10:30-11:00 **Coffee break**

11:00-12:30 **Measurement methods for black and brown carbon (PD Dr. Petzold)**: carbonaceous species, "terminology", measurement methods (thermo-optical, thermal, optical, on-line, off-line), measurement intercomparisons

12:30-14:00 **Lunch break**

14:00-15:30 **Aerosol & respiratory system (Prof. Dr. Hofmann)**: structure of the human respiratory tract, physical deposition mechanisms, fluid dynamics in the lung, computational deposition models, experimental deposition methods, particle/vapor interaction, particle clearance and retention

15:30-16:00 **Coffee break**

16:00-17:30 **PM & health effects (Prof. Dr. Riediker)**: additional health effects, e.g. heart diseases etc.

SATURDAY, 15 July 2017 – FIELD EXPERIMENT

08:30-10:00	**Visibility and atmospheric optics (Prof. Dr. Horvath)**: relative air mass and attenuation, visibility theory, sky radiance, Angström formula, elements of radiative transfer, radiative forcing
10:50	Departure by bus from Boltzmanngasse 5, Vienna, to **Hohe Wand**
13:00	**Field experiment (Prof. Dr. Horvath):** Visual determination of visibility and extinction
16:30	Departure from Hohe Wand
17:00	**Presentation of results, general discussion**
17:30	**Heuriger** by invitation of the Association for Aerosol Research GAeF in Möllersdorf
20:00	Departure from Möllersdorf
21:00	Arrival at Boltzmanngasse 5, Vienna